UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/620,747	07/16/2003	Mark S. Moir	6000-33600	8970

58467   7590   01/10/2008
MHKKG/SUN
P.O. BOX 398
AUSTIN, TX 78767

EXAMINER
TECKLU, ISAAC TUKU

ART UNIT	PAPER NUMBER
2192	

MAIL DATE	DELIVERY MODE
01/10/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

AK

	Application No.	Applicant(s)
Office Action Summary	10/620,747	MOIR ET AL.
	Examiner	Art Unit
	Isaac T. Tecklu	2192

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>19 October 2007</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-59</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-59</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some *   c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

1.   This action is responsive to the amendment filed on 10/19/2007.

2.   Claims 2-4, 16, 19 and 46-55 have been amended.

3.   Claims 1-59 have been reexamined.

Claim Rejections - 35 USC § 102

4.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this
>
> or a foreign country, before the invention thereof by the applicant for a patent.

5.   Claims 1-15, 17-32, 34-49 and 51-59 rejected under 35 U.S.C. 102(a) as being

anticipated by Daynès (US 6,182,186 B2).

Per claim 1, Dice discloses a method of providing non-blocking multi-target transactions

in a computer system (e.g. FIG. 7 and related text), the method comprising:

defining plural transactionable locations, wherein individual ones of the transactionable

locations encode respective values and are owned by no more than one transaction at any given

point in a multithreaded computation (col. 18: 15-25 "... transaction owns an exclusive type of

lock ..." and e.g. FIG. 4 and FIG. 11, 1148 and related text);

for a particular multi-target transaction of the multithreaded computation, attempting to

acquire ownership of each of the transactionable locations targeted thereby (col. 17: 65-67 and

col. 18:1-10 "... if the ownership test fails ..."), wherein the ownership acquiring wrests

ownership from another transaction, if any, that owns the targeted transactionable location (col.

18:45-50 "... single-owner lock states of each locking contex..."); and

once ownership of each of the targeted transactionable locations has been acquired,

attempting to commit the particular multi-target transaction using a single-target

synchronization primitive to ensure that, at the commit (col. 19:1-15 "... a locking context is

active ... bit numbers that appear in its owner ..."), the particular multi-target transaction

continues to own each of the targeted transactionable locations, wherein individual ones of the

multi-target transactions do not contribute to progress of another (col. 20:5-15 "... swo are

single owner lock states ...single owner lock states corresponding to the transaction this cache

belongs to... ").

Per claim 2, Dice discloses the method of claim 1, wherein the ownership wresting

employs a single-target synchronization primitive to change status of the wrested from

transaction to be incompatible with a commit thereof (col. 12:30-40 "... lock on the same

resource are incompatible with each other ...").

Per claim 3, Dice discloses the method of claim 2, wherein, as a result of the status

change, the wrested from transaction fails and retries (col. 17: 65-67 and col. 18:1-10 "... if the

ownership test fails ...").

Per claim 4, Dice discloses the method of claim 2, wherein the wrested from transaction is itself a multi-target transaction (col. 2:15-25 "... lock permits multiple transactions to read ...").

Per claim 5, Dice discloses the method of claim 1, further comprising: on failure of the commit attempt, reacquiring ownership of each targeted transactionable location and retrying (col. 17: 65-67 and col. 18:1-10 "... if the ownership test fails ...").

Per claim 6, Dice discloses the method of claim 1, wherein no transaction may prevent another from wresting therefrom ownership of transactionable locations targeted by the active transaction (col. 20:5-15 "... swo are single owner lock states ...single owner lock states corresponding to the transaction this cache belongs to... ").

Per claim 7, Dice discloses the method of claim 1, wherein the ownership acquiring employs a single-target synchronization primitive to update the ownership of the targeted transactionable location (col. 3:10-25 "... lock data structure is updated ..." and e.g. FIG. 7, step 714 and related text).

Per claim 8, Dice discloses the method of claim 1, wherein each encoding of a transactionable location is atomically updateable using a single-target synchronization primitive (col. 10:55-65 "... maintain atomicity ...").

Per claim 9, Dice discloses the method of claim 1, wherein the individual transactionable location encodings further include an identification of the owning transaction's corresponding value for the transactionable location (e.g. FIG. 7, step 708 and related text).

Per claim 10, Dice discloses the method of claim 1, further comprising: accessing values corresponding to individual ones of the transactionable locations using a wait-free load operation (e.g. FIG. 7, step 714 and related text).

Per claim 11, Dice discloses the method of claim 1, wherein the transactionable locations directly encode the respective values (e.g. FIG. 7, step 708 and related text).

Per claim 12, Dice discloses the method of claim 1, wherein the transactionable locations are indirectly referenced (e.g. FIG. 9, step 902 and related text).

Per claim 13, Dice discloses the method of claim 1, wherein the transactionable locations are encoded in storage managed using a nonblocking memory management technique (e.g. GIG. 13 shows non-blocking synchronization ...").

Per claim 14, Dice discloses the method of claim 1, wherein the transactionable locations, if unowned, directly encode the respective values and otherwise encode a reference to the owning transaction (e.g. FIG. 7, step 708 and related text).

Per claim 15, Dice discloses the method of claim 1, wherein the single-target

synchronization primitive employs a Compare-And-Swap (CAS) operation (col. 17:35-55 "...

compare-and swap ...").

Per claim 17, Dice discloses the method of claim 1, wherein the single-target of the

single-target synchronization primitive includes at least a value and a transaction identifier

encoded integrally therewith (col. 16: 55-67 "... information can include register values ...").

Per claim 18, Dice discloses the method of claim 1, wherein the multi-target transaction

has semantics of a multi-target compare and swap (NCAS) operation (col. 17:35-55 "...

compare-and swap ...").

Per claim 19, Dice discloses the method of claim 1, embodied in operation of an

application programming interface (API) that includes a load operation and an multi-target

compare and swap (NCAS) operation (col. 17:35-55 "... compare-and swap ...").

Per claim 20, Dice discloses the method of claim 19, wherein the load operation is wait-

free (e.g. FIG. 7, step 714 and related text).

Per claim 21, Dice discloses the method of claim 1, embodied in operation of an

application programming interface (API) that provides transactional memory (e.g. FIG. 1 and

related text).

Per claim 22, Dice discloses an implementation of non-blocking, multi-target transactions that employs instances of one or more single-target synchronization primitives to acquire, for a particular multi-target transaction, ownership of targeted transactionable locations and to ensure that, at commit.

the particular multi-target transaction continues to own each of the targeted transactionable locations, wherein individual ones of the multi-target transactions do not contribute to progress of another (col. 17: 65-67 and col. 18:1-10 "… if the ownership test fails …")

Per claim 23, Dice discloses the implementation of claim 22, embodied as software encoded in one or more computer readable media and that, on execution as part of a concurrent computation, invokes the multi-target transactions (col. 2:15-25 "… lock permits multiple transactions to read …").

Per claim 24, Dice discloses the implementation of claim 22, wherein the ownership acquiring, when performed by a first one of the multitarget transactions, wrests ownership from respective other ones of the multi-target transactions, if any, that own respective ones of the targeted transactionable locations (col. 19:1-15 "… a locking context is active … bit numbers that appear in its owner …").

Per claim 25, Dice discloses the implementation of claim 24, wherein the wresting employs an instance of single-target synchronization primitive to change status of a wrested-

from transaction to be incompatible with a commit thereof (col. 12:30-40 "... lock on the same resource are incompatible with each other ...").

Per claim 26, Dice discloses the implementation of claim 25, wherein, as a result of the status change, the wrested-from transaction eventually fails and retries (col. 17: 65-67 and col. 18:1-10 "... if the ownership test fails ...").

Per claim 27, Dice discloses the implementation of claim 22, wherein no transaction may prevent another from wresting therefrom ownership of transactionable locations targeted by the active transaction (e.g. FIG. 7, step 708 and related text).

Per claim 28, Dice discloses the implementation of claim 22, wherein the transactionable locations directly encode the respective values (e.g. FIG. 7, step 708 and related text)..

Per claim 29, Dice discloses the implementation of claim 22, wherein the transactionable locations are indirectly referenced (e.g. FIG. 7, step 708 and related text)..

Per claim 30, Dice discloses the implementation of claim 22, wherein the transactionable locations are encoded in storage managed using a nonblocking memory management technique (e.g. FIG. 7, step 714 and related text).

Per claim 31, Dice discloses the implementation of claim 22, wherein the transactionable locations, if unowned, directly encode the respective values and otherwise encode a reference to the owning transaction (e.g. FIG. 7, step 708 and related text).

Per claim 32, Dice discloses the implementation of claim 22, wherein at least some instances of the single-target synchronization primitive employ a Compare-And-Swap (CAS) operation (col. 17:35-55 "... compare-and swap ...").

Per claim 34, Dice discloses the implementation of claim 22, wherein at least some of the multi-target transaction have semantics of a multitarget compare and swap (NCAS) operation (col. 17:35-55 "... compare-and swap ...").

Per claim 35, Dice discloses the implementation of claim 22, embodied as software that includes a functional encoding of operations concurrently executable by one or more processors to operate on state of the transactionable locations (e.g. FIG. 7, step 708 and related text).

Per claim 36, Dice discloses the implementation of claim 22, wherein at least some of the multi-target transactions are defined by an application programming interface (API) that includes a load operation and a multi-target compare and swap (NCAS) operation (col. 17:35-55 "... compare-and swap ...").

Per claim 37, Dice discloses the implementation of claim 22, wherein at least some of the multi-target transactions are defined by an application programming interface (API) that provides transactional memory (e.g. FIG. 1 and related text).

Per claim 38, Dice discloses the implementation of claim 22, wherein the multi-target transactions are obstruction-free, though not wait-free or lock-free (e.g. FIG. 7, step 714 and related text).

Per claim 39, Dice discloses the implementation of claim 22, wherein the implementation does not itself guarantee that at least one interfering concurrently executed multi-target transactions makes progress (e.g. FIG. 7, step 708 and related text).

Per claim 40, Dice discloses the implementation of claim 22, wherein a contention management facility is employed to facilitate progress in a concurrent computation (e.g. FIG. 4 and related text).

Per claim 41, Dice discloses the implementation of claim 40, wherein operation of the contention management facility ensures progress of the concurrent computation (e.g. FIG. 7 and related text).

Per claim 42, Dice discloses the implementation of claim 40, wherein the contention management facility is modular such that alternative contention management strategies may be

employed without affecting correctness of the implementation (e.g. FIG. 7, step 716 and related

text).

Per claim 43, Dice discloses the implementation of claim 40, wherein the contention

management facility allows changes in contention management strategy during a course of the

concurrent computation (e.g. FIG. 7, step 708 and related text).

Per claim 44, this is the program product version of the claimed method discussed above

(Claim 22), wherein all claim limitations have been addressed and/or covered in cited areas as

set forth above. Thus, accordingly, these claims are also anticipated by Dice.

Per claim 45, this is the program product version of the claimed method discussed above

(Claim 24), wherein all claim limitations have been addressed and/or covered in cited areas as

set forth above. Thus, accordingly, these claims are also anticipated by Dice.

Per claim 47, this is the computer readable medium version of the claimed method

discussed above (Claim 7), wherein all claim limitations have been addressed and/or covered in

cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dice.

Per claim 48, this is the computer readable medium version of the claimed method

discussed above (Claim 4), wherein all claim limitations have been addressed and/or covered in

cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dice.

Per claim 49, this is the computer readable medium version of the claimed method discussed above (Claim 15), wherein all claim limitations have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dice.

Per claim 51, this is the computer readable medium version of the claimed method discussed above (Claim 17), wherein all claim limitations have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dice.

Per claim 52, this is the computer readable medium version of the claimed method discussed above (Claim 1), wherein all claim limitations have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dice.

Per claim 53, this is the computer readable medium version of the claimed method discussed above (Claim 18), wherein all claim limitations have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dice.

Per claim 54, this is the computer readable medium version of the claimed method discussed above (Claim 5), wherein all claim limitations have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dice.

Per claim 55, Dice discloses a encoding of claim 46, wherein the computer readable medium includes at least one medium selected from the set of a disk, tape or other magnetic,

optical, or electronic storage medium and a network, wireline, wireless or other

communications medium (e.g. FIG. 1 and related text).

Per claim 56, this is the apparatus version of the claimed method discussed above (Claim

1), wherein all claim limitations have been addressed and/or covered in cited areas as set forth

above. Thus, accordingly, these claims are also anticipated by Dice.

Per claim 57, this is the computer readable medium version of the claimed method

discussed above (Claim 7), wherein all claim limitations have been addressed and/or covered in

cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dice.

Per claim 58, this is the computer readable medium version of the claimed method

discussed above (Claim 2), wherein all claim limitations have been addressed and/or covered in

cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dice.

Per claim 59, this is the computer readable medium version of the claimed method

discussed above (Claim 4), wherein all claim limitations have been addressed and/or covered in

cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Dice.

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in

section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the

manner in which the invention was made.

7.   Claims 16, 33 and 50 rejected under 35 U.S.C. 103(a) as being unpatentable over Daynes

in view of Maged et al ("Non-Blocking Algorithms and Preemption-Safe Locking on

Multiprogrammed Shared Memory Multiprocessors", March 1997).

Per claims 16, 33 and 50 Dice do not explicitly disclose wherein the single-target

synchronization primitive employs Load-Linked (LL) and Store-Conditional (SC) operation

pair. However, Maged et al. discloses non blocking algorithms (See Section 3, page 5). Figure

2, page 7 shows a non-blocking counter implementation using load-linked/store –conditional. In

addition, Maged et al. discloses emulation using load-linked and store – conditional instruction

(page 13). Therefore it would have been obvious to employ Load-linked and Store-Conditional

operation to read, modify and write a shared location as once suggested by Maged et al. (page

3).

Response to Arguments

8.   Applicant's arguments with respect to claims 1-59 have been considered but are moot in

view of the new ground(s) of rejection. See Daynes and Maged et al.
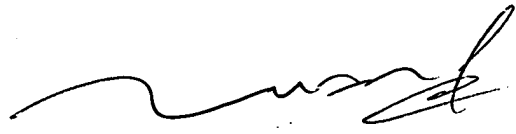
Conclusion

9.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Isaac T. Tecklu whose telephone number is (571) 272-7957. The examiner can normally be reached on M-TH 9:300A - 8:00P.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam can be reached on (571) 272-3695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TUAN DAM
SUPERVISORY PATENT EXAMINER

Isaac Tecklu

Art Unit 2192